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ABSTRACT

This study was conducted to determine the positive or negative relationship between school athletic program participation and the academic achievement of students in the 4th through 11th grades as measured by the California Tests of Basic Skills (CTBS). CTBS tests are taken in grades 4 and 11 and their scores are compared to scores from students in the rest of the United States. The comparison yields percentiles in which the students are placed, and it is these percentiles that are used in this study. Athletic programs are programs in which a student can participate in an extracurricular sporting activity. In this study, both male and female students who either did not play sports at all or who participated in school-sponsored baseball, basketball, cheerleading, football, golf, softball, or tennis at any time from the 4th grade through the 11th grade were eligible. Twenty students formed the experimental group, and 20 made up a control group. Each group was further subdivided into 10 boys and 10 girls. The four groups were classified into boys who did not play sports and girls who did not play sports (control groups), and two experimental groups: boys who played sports and girls who played sports. The evaluation of the data showed no significant differences in the CTBS percentiles of any of the groups in this study. The boys and girls of the experimental group and the boys and girls of the control group showed no significant differences when analyzed together. CTBS test percentiles of all groups fluctuated from 4th through 11 grades, but the fluctuation was not enough to show significance in this study. Five appendixes contain information on the scores and their statistical analyses. (Contains 7 graphs, 20 tables, and 27 references.) (SLD)

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ED 423 255

A STUDY TO DETERMINE THE EFFECTS OF SCHOOL ATHLETIC PROGRAMS ON THE CTBS TEST PERCENTILES OF STUDENTS

A Thesis

Presented to

the Faculty of the Graduate School

Salem-Teikyo University

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Paula Fleenor

December 1997

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Salem-Teikyo University

Salem, West Virginia

This thesis submitted by Paula Fleenor has been approved as meeting the research requirements for the Master of Arts degree.

John F. Cirrone
Research Advisor

Dean for Graduate Education
Programs and Professor of
Education,
Salem-Teikyo University
Salem, West Virginia

Gary S. McAllister
Graduate Study
Committee Member

Dean for Teacher Education Programs
And Professor of Education,
Salem-Teikyo University
Salem, West Virginia

Graduate Study
Committee Member

Assistant Professor of Education
Salem-Teikyo University,
Salem, West Virginia

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ABSTRACT

A Study to Determine the Effects of School Athletic Programs on the CTBS Test Percentiles of Students

by

Paula Fleenor

The purpose of this research was to determine the effects of school athletic programs on the CTBS test percentiles of students. CTBS tests are taken by students in the fourth and eleventh grades, and their scores are compared to the scores of other students in the United States. The comparison yields percentiles in which the students are placed, and it is these percentiles which are utilized in this study. Athletic programs are programs in which a student can participate in an extra-curricular sporting activity. In this study, both male and female students who either did not play sports at all or who participated in school sponsored baseball, basketball, cheerleading, football, golf, softball, or tennis at any time from the fourth grade to the eleventh grade were eligible.

A total of forty students participated in this study. Twenty students made up the experimental group, and twenty students made up the control group. Each group was further

subdivided into ten boys and ten girls. The four groups of ten students were classified according to boys who did not play sports (control group), girls who did not play sports (control group), boys who played sports (experimental group), and girls who played sports (experimental group).

The evaluation of the data showed no significant differences in the CTBS test percentiles of any of the groups of students in the study. The boys and girls of the experimental group and the boys and girls of the control group showed no significant differences when analyzed together. CTBS test percentiles of boys who played sports, boys who did not play sports, girls who played sports, and girls who did not play sports all fluctuated from fourth to eleventh grades, but the fluctuation was not enough to show significance in this study.

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Chapter One

THE ISSUE AND ITS SETTING

Research Question

What is the positive or negative relationship between school athletic programs and the academic achievement of students in the fourth through eleventh grades?

The Hypothesis

The hypothesis is that school athletic programs will have a positive effect on the academic achievement of students between the fourth and eleventh grades.

The Delimitations

The study will not attempt to provide the results of the majority of students at a rural high school.

The study did not evaluate all students who volunteered; it is limited to forty students. Twenty male and twenty female students were randomly selected from a pool of ninety-seven volunteers which was made up of 43 females and 54 males.

The study is limited to Caucasian males and females at a rural high school and did not have

available students of a minority background for participation.

Assumptions

The First Assumption. The first assumption is that the sample size is adequate.

The Second Assumption. The second assumption is that the sample size is typical of rural high school students.

The Third Assumption. The third assumption is that the instruments used are valid.

The Fourth Assumption. The fourth assumption is that all of the various sports involved in the study will affect students in the same way.

The Importance of the Study

Students all over the United States and even the world are encouraged by both their parents and their peers to participate in sports. Schools have responded to the problem by making available extra-curricular sports programs that compete with teams from other schools. Many people believe that participation in sports provides an outlet where children can positively release their energy, but others believe sports can go so far as to influence academic behavior. This study would contribute to the discovery of a correlation

between athletics and academics by utilizing the CTBS test, a standardized test given to students in the fourth and eleventh grades. With the results of this study available, both government officials and school teachers can see the effects, if any, of school sponsored athletic programs on the academic achievement of participants.

The Definition of Terms

At-Risk Students. Students who carry a higher risk for involvement in illegal activities or activities which would otherwise hinder their education.

CTBS Test Percentiles. CTBS test percentiles are used to compare a student to other students within the United States. If a student falls in the 90th percentile, then he or she has scored better than 90% of students in the United States.

Minority. A part of the population differing from others in some characteristics and often subjected to differential treatment.

Physical Education. Courses in which a student engages in physical activity. Physical education is commonly referred to as "phys-ed" or "gym class."

School Athletic Programs. School athletic programs are programs in which a student can participate in an extra-curricular sporting activity. This study utilizes the athletic programs of baseball, basketball, cheerleading, football, golf, softball, and tennis.

Self-Concept. A person's total appraisal of his or her appearance, background and origins, abilities and resources, or attitudes and feelings, which culminates as a directing force in his or her behavior.

Abbreviations

ASI.	American Sports Institute.
CTBS.	Comprehensive Test of Basic Skills.
IQ.	Intelligence Quotient.
MIT.	Massachusetts Institute of Technology.
PASS.	Promoting Achievement in School Through Sport.
SES.	Socioeconomic Status.

Chapter Two

THE REVIEW OF THE RELATED LITERATURE

An Overview

The relationship between athletic involvement and academics has been the topic of considerable debate for many years (9:350).

Those opposed to school athletic programs claim that participation exerts a detrimental impact on scholarship because it diverts an excessive amount of both human and financial capital away from the primary objectives of schools (2:1957). Society's emphasis on athletics is seen as being in conflict with such manifest functions of the school as promoting academic excellence, transmitting knowledge, and fostering the development of the adolescent (18:28).

The Zero-sum theory is concerned with athletic participation diverting attention from academic work. Coleman views the adolescent society as a finite system in which commitment to academic, athletic, or social value represents a loss to the other two (1:1961). Athletic programs are deemed costly frills in many instances, but they may in fact be a large part of the solution

to the problems that face schools today (27:93).

Supporters contend that athletic participation has a beneficial impact on academic achievement (24:768). The social significance of high school sports has been approached in research by many positions. Developmental theory emphasizes the "socializing" or "character building" effects of athletic participation (25:310). Several reviews of empirical studies of the effects of sports participation (16:465; 19:42; 3:229) reported that the most commonly studied outcomes were academic achievement, educational and occupational aspirations and attainments, self-concept, and popularity.

Otto and Alwin found that sports participation of male students in the senior year of high school was positively related to educational and occupational aspirations, after controlling socioeconomic status (SES), IQ, and school grades (23:113). In a later study, Otto also concluded that sports participation in high school positively affected educational attainment, occupational status, and income of those subjects studied some 15 years later (3:229).

Smith examined the effects of interscholastic athletic participation on high school variables in a recent study and found that athletic participation had a strong, significant, direct effect on grades and citizenship. His study produced results that indicated that high school athletes were considerably less involved in school-related deviance, non-school related deviance, drug, alcohol, and tobacco abuse, and serious offenses with the law. This would show that grades, the strongest predictor of high school graduation, and citizenship, another important predictor of high school graduation, are both functions of participation in athletic programs (27:94).

One common area of research concerning the question of sports influencing academics is with GPA. Evidence from several sources supports the expectation that participation in sports and academic achievement are related. Some studies show that participation in athletics is related to low academic achievements (17:475), but these studies are in the minority.

The majority of studies indicate that athletes not only attain higher GPA's than other

students, but that their self-esteem and other effective characteristics are enhanced as well (13:271). Soltz says that participation in interscholastic athletics does not depress student athletes' GPA's below the average of their non-participating peers; students competing in athletics maintain significantly higher grades than those not involved in competitive sports (29:20). The trend clearly lies with athletics positively influencing academics.

At Penn State University, the entire coaching staff monitors the academic progress of their respective student-athletes. Coaches also hold study-table sessions for those in need of assistance. Thirty-seven percent of all Penn State student-athletes earned at least a 3.0 grade point average in the spring of 1996 (32:1).

Researchers at the Massachusetts Institute of Technology encourage sports participation at any level. Their philosophy is that sports enrich an already diverse educational setting, and sports may also help to purge some of the frustrations of schoolwork and life in general. Students attend MIT to get an education, and playing sports can only help (31:3).

Aside from GPA, another method of testing whether or not athletics positively influences academics is by comparing the high school dropout rates of athletes and non-athletes. Harden found that the high school in Chicago with the highest dropout rate in the city, 69.5 percent, had a dropout rate among athletes of only 7 percent. The high school with the second highest dropout rate among the city's enrollment, 67 percent, had a dropout rate for athletes of 5 percent. Further, a high school with a dropout rate of 55.9 percent had a dropout rate among athletes of 0.8 percent (14:1987). School athletic programs should be recognized for their ability to positively affect academics and lower the dropout rate (27:97).

National surveys show that participants in high school co-curricular activities attain better grades than when they did not participate. Participation helps develop basic values such as self-respect, self-esteem, self-confidence, and competitive spirit. Furthermore, the participant learns the value of teamwork and experiences how to win and how to lose. These intangibles are educational experiences and as important in a

student's total preparation for being a productive citizen in later life as grades earned in the academic classroom (11:34).

Eligibility Rules for Athletic Participation

One way of ensuring that athletic participation does not hinder athletic achievement is to tie the two together. Eligibility rules accomplish that very objective. They exist in all fifty states and the District of Columbia for the purpose of emphasizing academic competence over athletic performance (22:5).

Eligibility rules are popular for many reasons. Ruffin summarizes them as:

1. The threat of removal of athletic participation will motivate students to work harder in the classroom.

2. Academic eligibility rules will demonstrate to all students that school's top priority is academic excellence.

3. Such policies will caution against athletic paractices and events that demand as much time of a student that the student's academic performance is compromised.

4. Policies which emphasize academic performance over athletic success simultaneously encourage the development of vocational skills which are important to future employers (26:7).

As convincing as the arguments in support of eligibility rules are, there are reasons against their implementation. Morton lists them as:

1. Eligibility policies unfairly penalize students who are less able academically by depriving them of participation in something they do well.

2. Such policies restrict participation in interscholastic athletics which is an integral and a valuable component of a student's education.

3. Participation in athletics is the only thing keeping some students in school

4. Pressure on teachers to maintain the academic eligibility of student athletes may result in a double academic standard for the athlete and the non-athlete.

5. Eligibility policies may hurt talented athletes' chances for college athletic scholarships (22:9).

There are convincing arguments both for and against eligibility rules for athletics, but the courts tend to agree with the arguments for their implementation. In 1987, the Montana Supreme Court upheld the 2.0 grade point policy, ruling that participation in activities was not a fundamental right of a student. The court also ruled that the government's interest in providing a basic system of quality public education by

enactment of the 2.0 grade rule outweighed students' interest in participating in athletics. In Louisiana, the court decided that the rule was rationally related to the promotion of academic excellence in barring a student from trying out for the cheerleading squad (4:156).

Minorities, Athletics, and Academics

An important unknown in the area of athletic participation influencing academics is how minority students are affected. Researchers, parents, and teachers mostly agree that if youngsters are not reached before or during early adolescence, there is great danger of students later becoming unreachable by conventional means. With minority students, this is amplified because many can be considered at-risk students. To give these minority students the opportunity to thrive that they otherwise would not have, many people view athletic involvement as the right solution (15:3).

The great majority of the "sport participation effects" studies have focused on white males and, to a much lesser extent, on white females, but only a handful of studies have examined the effects of high school athletic

participation on African-American or other minority youth. Most of the minority studies focus on males, and only a handful of the already few studies there are focus on Hispanic youth and females (20:296).

In 1991, Braddock examined the effects of interscholastic and intramural athletic participation on educational outcomes, plans, peer status, and investment behaviors among African-American male eighth graders. Analysis of the results showed that sports participation is positively associated with aspirations of African-American eighth grade males to enroll in academic or college preparatory programs in high school, to have definite plans to complete high school, and to attend college (10:113).

In a study of 2,217 African-American students in 1,052 participating high schools, Hawkins found supporting evidence for the association between athletic participation and academic resilience for both interscholastic and intramural sports activities. Generally, male and female athletes are more likely to have higher educational aspirations and hold higher social standing among their peers than non-athletes (15:16).

Melnick, Sabo, and Vanfossen studied a sample of 3,686 minority youth who were sophomores in 1980 and seniors in 1982. The independent variable was athletic participation, and the dependent variables included senior year popularity, extracurricular involvement, grades, achievement test performance, dropout rates, and educational expectations. They found that sports participation was generally unrelated to grades and standardized test scores, but athletic participation was significantly related to lower dropout rates for some minority youth. Another result was that not all racial or ethnic groups reap the same benefits from sport. High school sports should only be considered one of many institutional forces converging in the lives of American minority youth (20:295).

In 1990, Snyder and Spreitzer conducted a study involving African-American, Hispanic, and Caucasian males. They looked at the relationship between athletic participation and academic achievement, and their findings support a positive relationship between high school athletic participation and higher academic achievement (28:390).

The prevailing model is that the athletic role enhances the academic role. Durbin says national surveys show that participants in high school co-curricular activities attain better grades than when they did not participate. In his view, athletic participation in high school is a valuable educational experience (11:34).

Braddock suggests that athletic participation may provide unique opportunities for students, expecially African-American males and females who tend to devote considerable time, energy, and resources to athletic pursuits. These opportunities include helping to learn and practice strategies that help students to make greater investments in academic pursuits and to recover from disappointing performances by re-investing academically and making constructive improvements in performance (10:114).

The PASS Program

Promoting Achievement in School through Sports (PASS) is an academic high school curriculum developed by the American Sports Institute (ASI). It is a daily, year-long, credit-bearing, physical education elective for

students who love sports but are not performing up to their academic potential.

PASS is based on the concept that the principles and skills that lead to success in athletics are the same as those that lead to success in academics. Students in the course study eight fundamentals in athletic mastery: concentration, balance, relaxation, power, rhythm, flexibility, attitude, and instinct. Students are recommended for the class by their counselor, a teacher, or the athletic director (5:1).

The goal for the first year of the PASS program was to increase the GPA for half of the PASS students by a minimum of half a grade point. This goal was met, as 55 percent of the PASS students increased their grades in academic subjects as well as physical education (5:3).

The second year PASS impact study indicates that PASS students' grades increased a combined total of +3.6 or an average improvement of +0.2 grade points per student. In contrast, the control group grades decreased by a combined total of -4.1 or an average loss of -0.2 grade points per student (6:3).

The PASS program also conducted an impact study for the third year. This study indicated that 49 percent of the PASS students improved their grades compared to 32 percent of the control group. However, grades of 35 percent of the PASS students and 53 percent of the control group students did go down. Overall, grades increased a combined total of +2.33 or an average improvement of +0.04 grade points per PASS student. In contrast, the control group grades decreased by a combined total of -11.7 or an average loss of -0.2 grade points per student (7:5).

Finally, the PASS students were also studied by the American Sports Institute in a fourth year impact study. During the four year period that PASS students were studied, 47 percent more PASS students than control group students increased their grades. The percentage of PASS students who increased their grades by a full grade point or more shows a similar increase. On average, twice as many PASS students as control group students had increased their grades by a full grade point or more. Overall, PASS students outperformed their counterparts in the control group by a quarter of a grade point (8:7).

All of the impact studies and summary reports confirm that by participating in the PASS program, high school students improve their academic performance as measured by overall GPA. Further, the report supports the view held by the American Sports Institute that in order to improve the academic performance of physically-oriented students, there needs to be an increased--rather than a decreased--emphasis on the appropriate study and practice of sport (30:1).

Extra-Curricular Activities Beyond Athletics

Nearly every student in the American educational system has experienced co-curricular or extra-curricular activities as either a spectator or a participant. Research on athletic participation is plentiful, but outside of these bounds, research on the effects of participation in school activities is scant. History suggests that student participation in such activities as choir, band, and school clubs have a positive effect on everything from academic achievement to self-discipline and from citizenship to personal hygiene (21:36).

In a study addressing the relationship between music and academic achievement, Earhart

argues that music enhances knowledge in the areas of mathematics, science, geography, history, foreign language, physical education, and vocational training (12:167).

Finally, Morrison concludes that values of artistic accomplishment and understanding and carefully planned experiences in the arts will result in unique and positive influences on the critical aspects of intellectual and social development. Athletics should be encouraged, but alternative extra-curricular activities should be available as well (21:36).

Conclusion

Research findings indicate that interscholastic athletic programs result in reduced discipline problems, increased academic achievement, and higher graduation rates. Smith agrees, saying that it is important to explore the issue of athletics and its influence over academics. Like many other researchers, Smith believes that athletics can only enhance academics, and athletics should be treated as an integral part of the academic experience, not as a detriment (27:95).

Summary

From the material presented, it is evident that academics and athletics do have some sort of correlation. Researchers do not all agree on exactly what this correlation is, but the majority of research points to athletics benefitting academics in both white and minority students.

Research also indicates that other extra-curricular activities have a beneficial impact on academics. One such example is with music and band programs. More extensive research needs to be done, but the majority of current research indicates that sports and other extra-curricular activities enable a student's academic success.

Chapter Three

THE DATA AND THE TREATMENT OF THE DATA

The Data

The data for this research is made up of CTBS test percentiles for the participants, who range from the fourth to the eleventh grade. The numerical data were subjected to two types of statistical analysis. With the first method, the data were averaged and graphed, and error bars were calculated to determine significance. The second method utilized a statistical t-test to determine if there was significant difference between two groups.

The Sample

The population from which the students were chosen is characterized as students at a rural, isolated, low-income high school. The sample consists of forty students ranging from seventeen to eighteen years of age. Twenty of the students were male, and twenty were female. The participants in the control group did not participate in any school sponsored extra-curricular sporting activities. The participants in the experimental group participated in either

school sponsored baseball, basketball, cheerleading, football, golf, softball, or tennis. All participants in the study were enrolled at the same high school. Subjects participated in the study on a volunteer basis, and twenty male and twenty female students were selected from the pool of 97 volunteers.

The Criteria for the Admissibility of the Data

The instrument selected is an acceptable method of measuring academic achievement. The instrument used was CTBS test percentiles, which compare students used in the study with other students in the United States. The CTBS test is a nationally administered exam, and the percentiles have been increasingly used throughout the country as a standard by which school academic excellence is measured.

The Research Methodology

This study was designed to determine the effects of participating in school athletic programs on academic achievement, which was measured by CTBS test percentiles. The experimental group was composed of ten boys and ten girls. The control group also consisted of

ten boys and ten girls. All participants were randomly selected from a pool of 97 volunteers. CTBS test percentiles for the fourth and eleventh grades were utilized to test the effectiveness of the treatment.

Data were collected from the permanent record cards of students who participated in the study. The experimental group was made up of students who participated in school athletic programs between the fourth and eleventh grades. The students in the control group participated in no school athletic programs between the fourth and eleventh grades. The error bars were calculated for the first statistical method, and the results were graphed. Overlapping error bars indicated a rejected hypothesis, and error bars that did not overlap supported the hypothesis.

The comparison of results from the second statistical method used a t-test performed on the raw scores, with the results then recorded. If there was a significant difference between the two groups at the 0.05 level of significance then the hypothesis was accepted.

Procedures

The CTBS test percentiles for the control and experimental groups were collected. For the first method for statistical analysis, the scores for the fourth grade were averaged for both groups, and this average was used as the baseline mean. This mean was subtracted from the CTBS test percentile values from the eleventh grade, resulting in the deviation from the baseline mean. The deviation from the baseline mean was used to calculate standard error. Error bars were calculated by multiplying the standard error by two.

For the second method of statistical analysis, range and arithmetic mean score were determined from the data. The variance and the estimated standard deviation of populations were then found, and degrees of freedom were calculated. The statistical nature of the data was determined by a two sample t-test to determine if there was a significant difference between the two groups.

Chapter Four

RESULTS

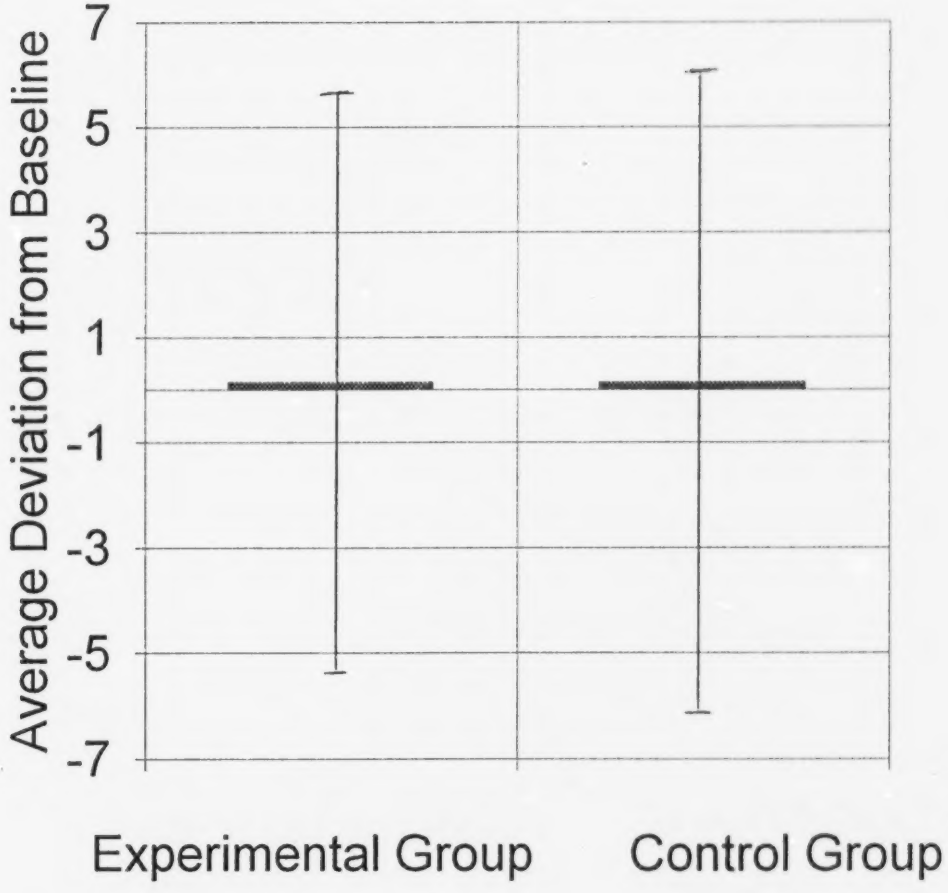
Statistical Method One

The hypothesis for this study was that school athletic programs would have a positive effect on the academic achievement of students.

Graph 1 compares the average deviation from the baseline mean for the experimental group with the average deviation from the baseline mean for the control group. Each group was comprised of twenty students. The experimental group was made up of twenty students who played sports, and the control group was made up of twenty students who did not play sports. The average deviation from the baseline mean for the experimental group was 0.15 ± 5.5, and the average deviation from the baseline mean for the control group was 0.15 ± 6.1. The error bars overlap; therefore, the hypothesis that athletics will positively affect academics is rejected. Numerical values are given in Table 1, and Graph 1 is located in on page 26.

GRAPH 1

Experimental Group Versus Control Group



Graph 1 shows the average deviation from the baseline mean for the experimental and control groups. Each group was composed of twenty students. The average deviation from the baseline mean for the experimental group was 0.15 ± 5.5. The average deviation from the baseline mean for the control group was 0.15 ± 6.1. Error bars were calculated by multiplying standard error by two.

Table 1

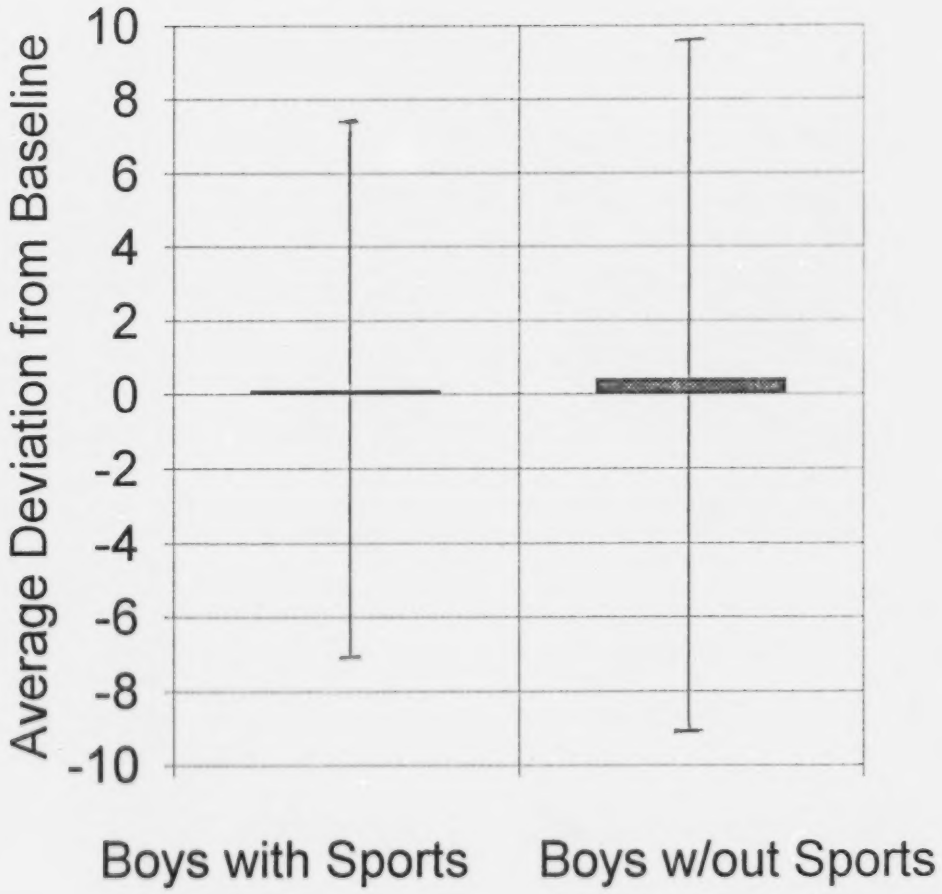
EXPERIMENTAL GROUP VERSUS CONTROL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Experimental	72.30	0.15±5.5	2.75
Control	71.15	0.15±6.1	3.05

Graph 2 compares the average deviation from the baseline mean for boys in the experimental group with the average deviation from the baseline mean for boys in the control group. Ten boys were taken from the experimental group, and ten boys were taken from the control group. The boys in the experimental group played sports between the fourth and the eleventh grades, and the boys in the control group did not. The average deviation from the baseline mean for the boys in the experimental group was 0.1±7. The average deviation from the baseline mean for the boys in the control group was 0.4±9.4. The error bars in Graph 2 overlap; thus the hypothesis that athletics positively affect academics is rejected. Numerical values are given in Table 2, and Graph 2 is shown in on page 28.

GRAPH 2

Boys in Experimental Group Versus Boys in Control Group



Graph 2 shows the average deviation from the baseline mean for boys in the experimental group and boys in the control group. The boys in the experimental group participated in athletics, and their average deviation from the baseline mean was 0.1 ± 7. For boys in the control group, those who didn't play sports, the average deviation from the baseline mean was 0.4 ± 9.4. Error bars were calculated by multiplying standard error by two.

Table 2

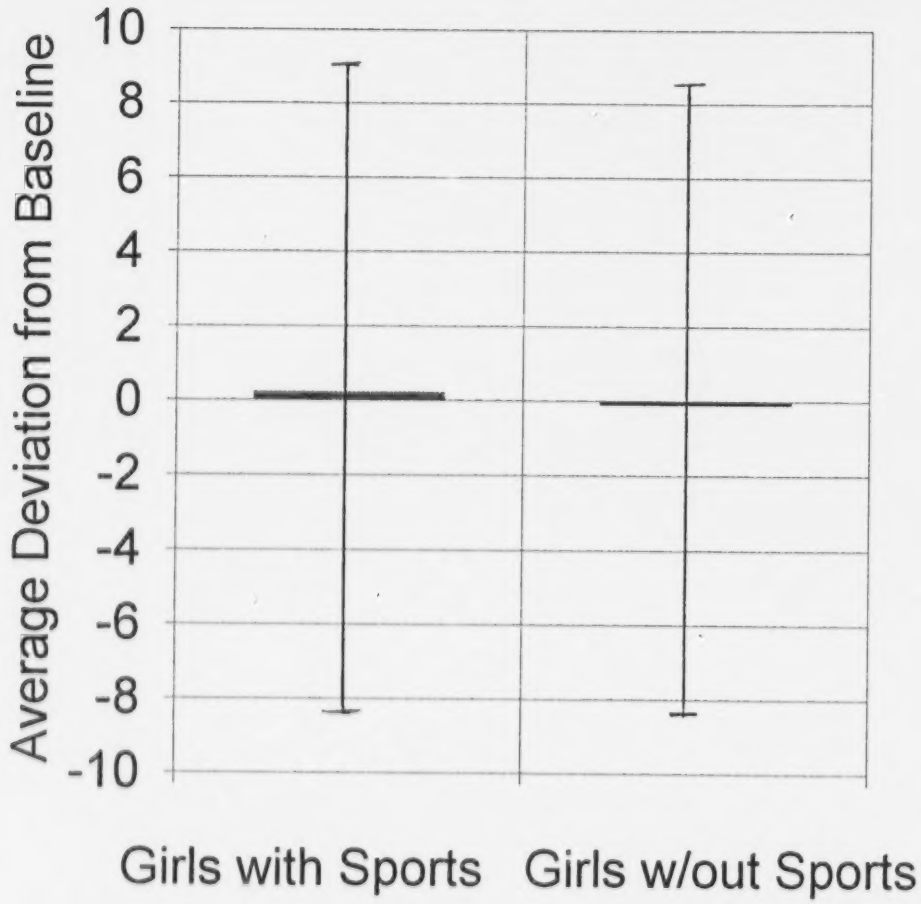
BOYS IN EXPERIMENTAL GROUP VERSUS BOYS IN CONTROL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Experimental	71.5	0.1+7	3.5
Control	70.3	0.4+9.4	4.7

Graph 3 compares the average deviation from the baseline mean for girls in the experimental group with the average deviation from the baseline mean for girls in the control group. Ten girls were taken from the experimental group, and ten girls were taken from the control group. The girls in the experimental group played sports between the fourth and the eleventh grades, and the girls in the control group did not. The average deviation from the baseline mean for the girls in the experimental group was 0.2 ± 8.74. The average deviation from the baseline mean for the girls in the control group was -0.1 ± 9.4. The error bars in Graph 3 overlap; thus the hypothesis that athletics positively affect academics is rejected. Numerical values are given in Table 3, and Graph 3 is shown on page 30.

GRAPH 3

Girls in Experimental Group Versus Girls in Control Group



Graph 3 shows the average deviation from the baseline mean for girls in the experimental group and girls in the control group. The girls in the experimental group participated in athletics, and their average deviation from the baseline mean was 0.2 ± 8.74. For girls in the control group, those who didn't play sports, the average deviation from the baseline mean was -0.1 ± 8.2. Error bars were calculated by multiplying standard error by two.

Table 3

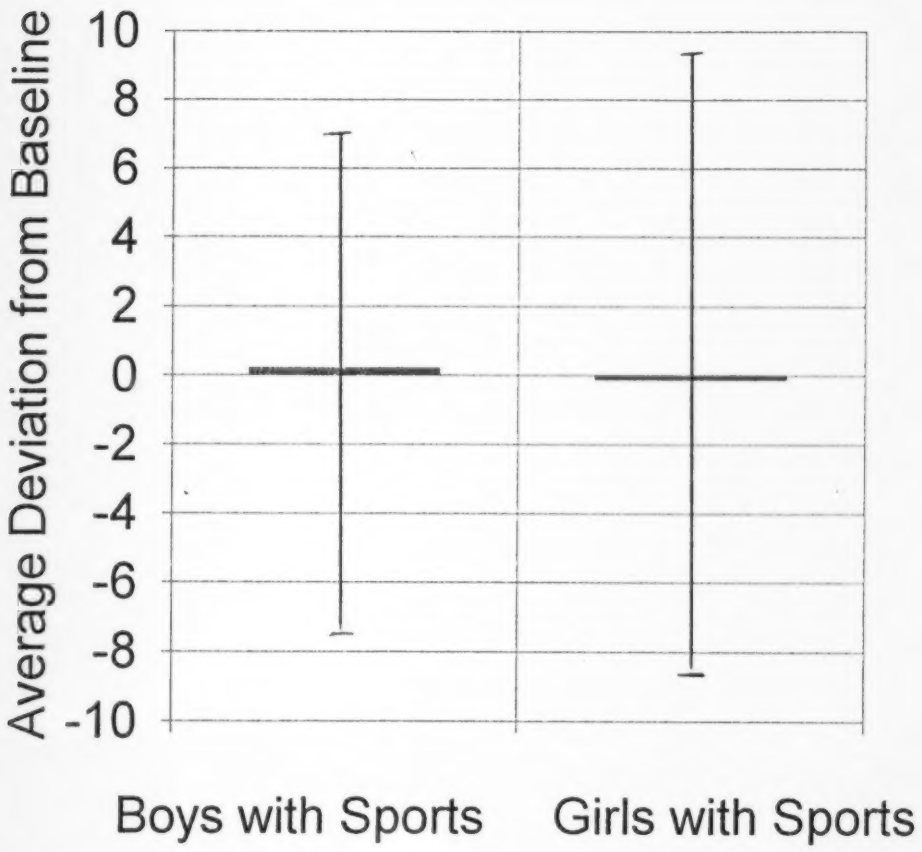
GIRLS IN EXPERIMENTAL GROUP VERSUS GIRLS IN CONTROL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Experimental	73.1	0.2±8.74	4.37
Control	72	-0.1±8.2	4.1

Graph 4 compares the average deviation from the baseline mean for boys in the experimental group with the average deviation from the baseline mean for girls in the experimental group. Ten boys and ten girls were each taken from the experimental group. The students in the experimental group participated in school sponsored athletics between the fourth and eleventh grades. The average deviation from the baseline mean for the boys in the experimental group was 0.1+7. The average deviation from the baseline mean for the girls in the experimental group was 0.2+8.74. The error bars in Graph 4 overlap; thus there is no significant difference between boys and girls in the experimental group. Numerical values are given in Table 4, and Graph 4 is shown on page 32.

GRAPH 4

Boys in Experimental Group Versus Girls in Experimental Group



Graph 4 shows the average deviation from the baseline mean for boys and girls in the experimental group. Both boys and girls in the experimental group participated in athletics. For the boys, the average deviation from the baseline mean was 0.1 ± 7. The average deviation from the baseline mean for the girls was 0.2 ± 8.74. Error bars were calculated by multiplying standard error by two.

Table 4

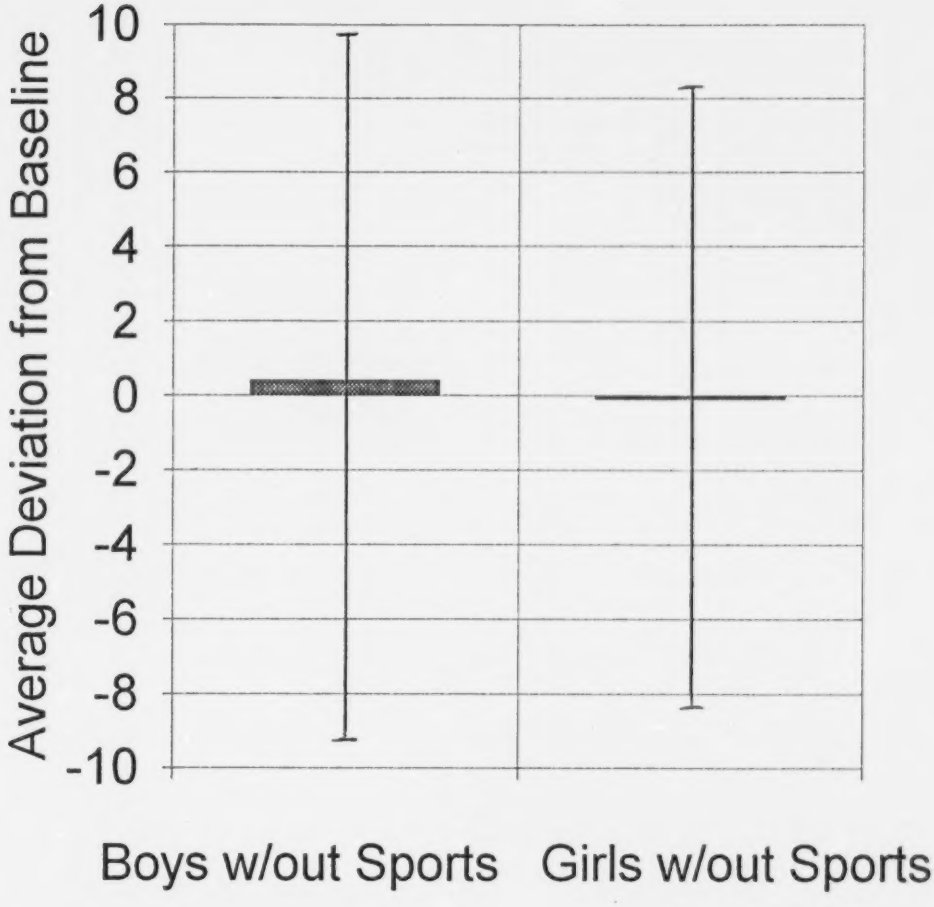
BOYS IN EXPERIMENTAL GROUP VERSUS GIRLS IN EXPERIMENTAL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Boys	71.5	0.1±7	3.5
Girls	73.1	0.2±8.74	4.37

Graph 5 compares the average deviation from the baseline mean for boys in the control group with the average deviation from the baseline mean for girls in the control group. Ten boys and ten girls were each taken from the control group. The students in the control group did not participate in school sponsored athletics between the fourth and eleventh grades. The average deviation from the baseline mean for the boys in the control group was 0.4+9.4. The average deviation from the baseline mean for the girls in the control group was -0.1+8.2. The error bars in Graph 5 overlap; thus there is no significant difference between boys and girls in the control group. Numerical values are given in Table 5, and Graph 5 is shown on page 34.

GRAPH 5

Boys in Control Group Versus Girls in Control Group



Graph 5 shows the average deviation from the baseline mean for boys and girls in the control group. Both boys and girls in the control group did not participate in athletics. For the boys, the average deviation from the baseline mean was 0.4 ± 9.4. The average deviation from the baseline mean for girls in the control group was -0.1 ± 8.2. Error bars were calculated by multiplying standard error by two.

Table 5

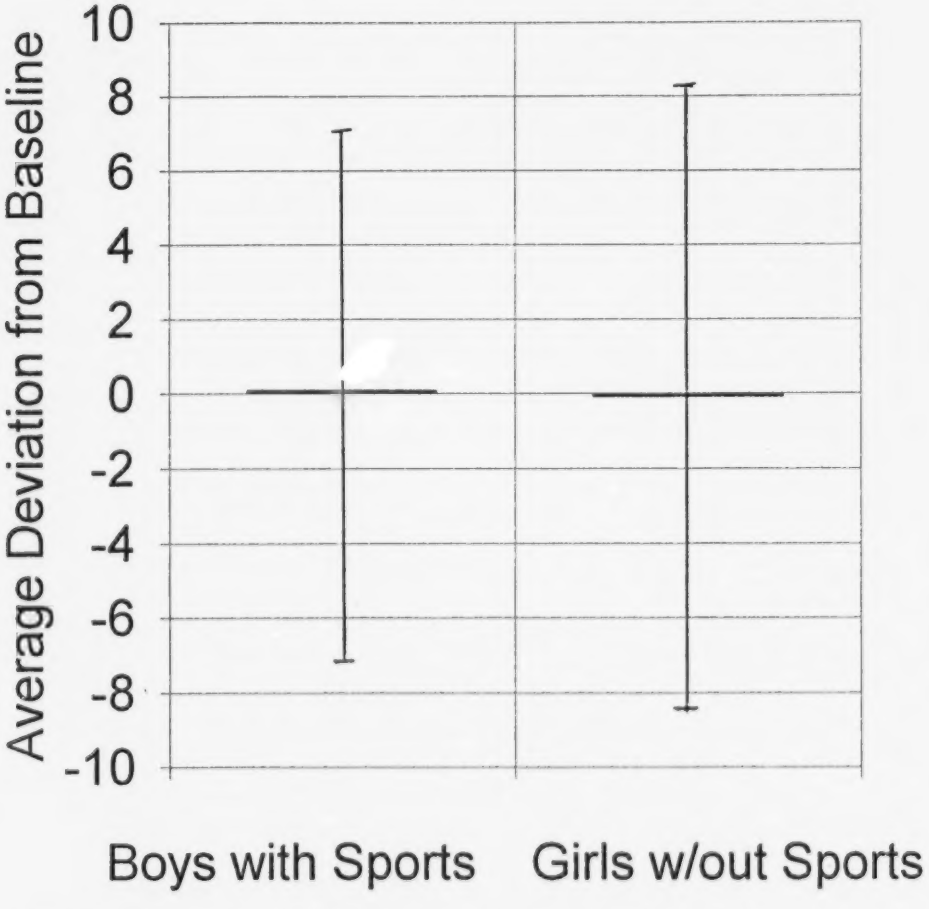
BOYS IN CONTROL GROUP VERSUS GIRLS IN CONTROL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Boys	70.3	0.4±9.4	4.7
Girls	72	-0.1±8.2	4.1

Graph 6 compares the average deviation from the baseline mean for boys in the experimental group with the average deviation from the baseline mean for girls in the control group. Ten boys were taken from the experimental group, and ten girls were taken from the control group. The boys in the experimental group played sports between the fourth and the eleventh grades, and the girls in the control group did not. The average deviation from the baseline mean for the boys in the experimental group was 0.1+7. The average deviation from the baseline mean for the girls in the control group was -0.1+9.4. The error bars in Graph 6 overlap; thus the hypothesis that athletics positively affect academics is rejected. Numerical values are provided in Table 6, and Graph 6 is shown on page 36.

GRAPH 6

Boys in Experimental Group Versus Girls in Control Group



Graph 6 shows the average deviation from the baseline mean for boys in the experimental group and girls in the control group. The boys in the experimental group participated in athletics, and their average deviation from the baseline mean was 0.1 ± 7. The girls in the control group, who did not participate in athletics, had a standard deviation from the baseline mean of -0.1 ± 8.2. Error bars were calculated by multiplying standard error by two.

Table 6

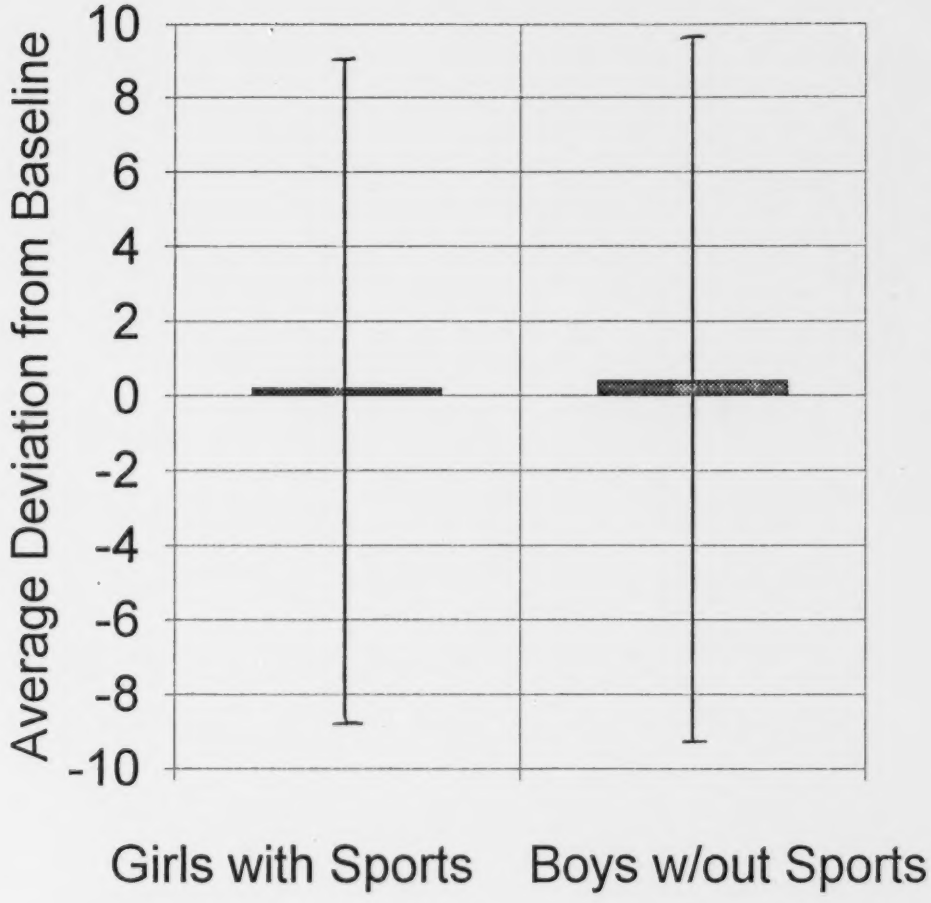
BOYS IN EXPERIMENTAL GROUP VERSUS GIRLS IN CONTROL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Experimental	71.5	0.1±7	3.5
Control	72	-0.1±8.2	4.1

Graph 7 compares the average deviation from the baseline mean for girls in the experimental group with the average deviation from the baseline mean for boys in the control group. The girls in the experimental group played sports between the fourth and the eleventh grades, and the boys in the control group did not. The average deviation from the baseline mean for the girls in the experimental group was 0.2±8.74. The average deviation from the baseline mean for the boys in the control group was 0.4±9.4. The error bars in Graph 7 overlap; thus the hypothesis that athletics positively affect academics is rejected. Numerical values are provided in Table 7, and Graph 7 is shown on page 38.

GRAPH 7

Girls in Experimental Group Versus Boys in Control Group



Graph 7 shows the average deviation from the baseline mean for girls in the experimental group and boys in the control group. The girls in the experimental group participated in athletics, and their average deviation from the baseline mean was 0.2 ± 8.74. For boys in the control group, those who didn't play sports, the average deviation from the baseline mean was 0.4 ± 9.4. Error bars were calculated by multiplying standard error by two.

Table 7

GIRLS IN EXPERIMENTAL GROUP VERSUS BOYS IN CONTROL GROUP

Group	Avg. CTBS Percentile in Grade 4 (Baseline)	Average Deviation from Baseline Mean	Standard Error
Experimental	73.1	0.2±8.74	4.37
Control	70.3	0.4±9.4	4.7

Statistical Method Two

A statistical t-test on the 4th grade scores for the experimental and control groups indicated that at the 0.05 level of significance the t-score is less than 2.021. This score signifies that at the beginning of the study, the two groups were not significantly different. The results of this t-test are given in Table 8.

Table 8

4th GRADE SCORES FOR EXPERIMENTAL AND CONTROL GROUPS

	$\bar{x}$	s^2	σ
Experimental	72.3	2858.2	53.46
Control	71.15	3513.55	59.27
Estimated σ of population: 4.0945			
t-test: 0.28086			

A statistical t-test on the 11th grade scores for the experimental and control groups showed that at the 0.05 level of significance the t-score is less than 2.021. This score signifies that at the conclusion of the study the two groups were not significantly different. The results of this t-test are given in Table 9.

Table 9

11th GRADE SCORES FOR EXPERIMENTAL AND CONTROL GROUPS

	x	s^2	σ
Experimental	72.45	2840.95	53.30
Control	71.3	3494.2	59.11
		Estimated σ of Population:	4.0831
		t-test:	0.28165

A statistical t-test on the 4th grade scores for the female students in the experimental and control groups indicated that at the 0.05 level of significance the t-score is less than 2.101. This score signifies that at the beginning of the study, the two groups of female students were not significantly different. The results of this t-test are given in Table 10.

Table 10

4th GRADE SCORES FOR FEMALE STUDENTS IN EXPERIMENTAL AND CONTROL GROUPS

	x	s^2	σ
Experimental	73.1	1552.9	39.41
Control	72	1572	39.65
Estimated σ of population: 5.8925			
t-test: 0.18668			

A statistical t-test on the 11th grade scores for the female students in the experimental and control groups showed that at the 0.05 level of significance, the t-score is less than 2.101. This score signifies that at the conclusion of the study, the two groups of female students were not significantly different. The results of this t-test are found in Table 11.

Table 11

11th GRADE SCORES FOR FEMALE STUDENTS IN EXPERIMENTAL AND CONTROL GROUPS

	x	s^2	σ
Experimental	73.3	1720.1	41.47
Control	71.9	1518.9	38.97
Estimated σ of population: 5.999			
t-test: 0.2334			

A statistical t-test on the 4th grade scores for the male students in the experimental and

control groups showed that at the 0.05 level of significance, the t-score is less than 2.101. This score signifies that at the beginning of the study, the two groups of male students were not significantly different. The results of this t-test are given in Table 12.

Table 12

4th GRADE SCORES FOR MALE STUDENTS IN EXPERIMENTAL AND CONTROL GROUPS

	$\bar{x}$	s^2	σ
Experimental	71.5	1292.5	35.95
Control	70.3	1926.1	43.89
Estimated σ of population: 5.9802			
t-test: 0.20066			

A statistical t-test on the 11th grade scores for male students in the experimental and control groups showed that at the 0.05 level of significance the t-score is less than 2.101. This score signifies that at the conclusion of the study, the two groups were not significantly different. The results of this t-test are given in Table 13.

Table 13

11th GRADE SCORES FOR MALE STUDENTS IN EXPERIMENTAL AND CONTROL GROUPS

	x	s^2	σ
Experimental	71.6	1106.4	33.26
Control	70.7	1968.1	44.36
Estimated σ of population: 5.84475			
t-test: 0.15398			

A statistical t-test on the 4th and 11th grade scores for the experimental group indicated that at the 0.05 level of significance the score is less than 2.021. This score signifies that at the conclusion of the study, the experimental group was not significantly different. The results of this t-test are found in Table 14.

Table 14

4th AND 11th GRADE SCORES FOR THE EXPERIMENTAL GROUP

	x	s^2	σ
4th Grade	72.3	2858.2	53.46
11th Grade	72.45	2840.95	53.30
Estimated σ of Population: 3.8727			
t-test: -0.0349			

A statistical t-test on the 4th and 11th grade scores for the control group indicated that at the 0.05 level of significance, the score is less than

2.021. This score signifies that at the conclusion of the study, the control group was not significantly different. The results of this t-test are found in Table 15.

Table 15

4th AND 11th GRADE SCORES FOR THE CONTROL GROUP

	x	s^2	σ
4th Grade	71.15	3512.55	59.27
11th Grade	71.3	3494.2	59.11
Estimated σ of Population: 4.2940			
t-test: -0.03493			

A statistical t-test on the 4th and 11th grade scores for the female students in the experimental group showed that at the 0.05 level of significance the score is less than 2.021. This score signifies that at the conclusion of the study the females in the experimental group showed no significant difference in their 4th grade and 11th grade CTBS scores. The results of this test are shown in Table 16.

Table 16

4th AND 11th GRADE SCORES FOR FEMALE STUDENTS IN THE EXPERIMENTAL GROUP

	x	s^2	σ
4th Grade	73.1	1552.9	39.41
11th Grade	73.3	1720.1	41.47
Estimated σ of Population: 6.0305			
t-test: -0.03316			

A statistical t-test on the 4th grade and 11th grade scores for the male students in the experimental group indicated that at the 0.05 level of significance the t-score is less than 2.101. This score signifies that at the conclusion of the stude the male students in the experimental group were not significantly different. The results of this t-test are found in Table 17.

Table 17

4th AND 11th GRADE SCORES FOR MALE STUDENTS IN THE EXPERIMENTAL GROUP

	x	s^2	σ
4th Grade	71.5	1292.5	35.95
11th Grade	71.6	1106.4	33.26
Estimated σ of Population: 5.1628			
t-test: -0.01937			

Summary of Results

A review of two separate statistical comparisons of the fourth grade CTBS test percentiles and the eleventh grade CTBS test percentiles for experimental and control groups revealed that there was no significant difference in academic achievement between those who participated in sports and those who did not.

A comparison of male students in the experimental group and male students in the control group also revealed no significant difference. Also, percentiles of female students in the experimental group and female students in the control group were not significantly different. Male students in the experimental group and female students in the experimental group were not significantly different, nor were male or female students in the control group.

In the comparison of male students from the experimental group with female students from the control group, no significant difference in percentiles was revealed. The comparison between female students in the experimental group and male

students in the control group also revealed no significant difference.

When Grade 11 scores for the experimental group were compared with Grade 4 scores for the experimental group, no significant difference could be seen. Similarly, no significant difference was observed in the comparison between Grade 4 control group scores and Grade 11 control group scores.

Finally, there was no significant difference between female, Grade 4 experimental group scores and female, Grade 11 experimental group scores. Neither was there a significant difference between male, Grade 4 experimental group scores and male, Grade 11 experimental group scores.

Because none of the data compared in the study showed any significant differences, the hypothesis that sports would have a positive effect on academic achievement is rejected.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This research study proposed to examine the effects of school athletic programs on the academic achievement of students. The hypothesis was that the students who participated in athletics between the fourth and eleventh grades would have higher CTBS test percentiles than the students who did not participate in sports between the fourth and eleventh grades.

The sample consisted of twenty male and twenty female students at a rural, isolated, low-income high school. The students' ages ranged from seventeen to eighteen years. The participants were enrolled in the same school, and each was presented with the same school curriculum. The forty students were randomly picked from a pool of ninety-seven volunteers. The experimental group consisted of ten males and ten females. The control group also consisted of ten males and ten females.

The instrument used in this study was standardized, normed, and a part of the school curriculum. The instrument tests all basic skills

of students and compares them to other students in the United States. All students were given the test in the fourth grade and in the eleventh grade, and test scores were obtained from the permanent record cards of the subjects.

Members of the experimental group participated in either baseball, basketball, cheerleading, football, golf, softball, or tennis between the fourth and eleventh grades. Their CTBS test percentiles from the fourth grade and eleventh grade were obtained. The mean from the fourth grade was determined and used to find the standard error. Members of the control group did not participate in baseball, basketball, cheerleading, football, golf, softball, or tennis; they participated in no athletic programs at all. Their CTBS test percentiles from the fourth and eleventh grades were also obtained and used to determine standard error.

To determine significance, the average deviation from the fourth grade scores (baseline mean) was graphed with error bars in the first method, and a t-test was used in the second method. In all of the statistical comparisons, no groups indicated any significant difference;

therefore, the hypothesis is rejected. The study shows that school athletic programs had no effect, either positive or negative, on the CTBS test percentiles of students.

Conclusion

In making statistical comparisons with the experimental and control groups, as well as with the male and female students involved in the study, a few points can be made. In this study, school athletic programs had no effect on CTBS test percentiles of students. The percentiles of some students, both male and female, went up, while the percentiles of other students, also both male and female, went down. In this study, athletic programs affected all students in the same way. This suggests that the motivation for academic achievement may come from other places.

The results may have been more favorable if a greater number of subjects had been involved in the study. It is easier for one student to have an extreme score and raise or lower the average and the standard error with a smaller group of subjects. This "spike" is eliminated when more students can be considered in the study.

The results also could have been different if students in the control group had never been introduced to sports at all. Though students in the control group did not participate in extra-curricular school sponsored athletics, all students participated in physical education, a required course in the school curriculum. Physical education is a required class for students from kindergarten to the ninth grade, and it is nearly impossible to exclude its effects from this study.

A third aspect that could change the results of the study is the inclusion of minority students. These students possess different cultural and family backgrounds that could change the results of the study. The sample of students used in the study included only Caucasian males and females.

Recommendations

The results of this study may have been different, and more favorable, if a few factors were changed.

The first recommendation would be to increase the sample size. The number of males and females used in the study was equal, but a greater sample

size would prevent one extreme score from raising or lowering both the average and the standard error.

The second recommendation would be to utilize test scores of students whose school curriculum did not include physical education from kindergarten to ninth grade. Physical education may skew the results, and the exclusion of physical education from the control group could benefit the study.

A third recommendation is that minority students be included in the study. No minority students were included in the pool from which the forty students were drawn, and thus no minority students could participate in the study. Minority students possess different social and cultural ideals, and their inclusion in the study could influence the results.

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Appendix A

Fourth Grade Scores, Eleventh Grade Scores, and Deviation from the Baseline Mean for the Experimental and Control Groups

TABLE 18: Raw Scores for Boys and Girls in the Experimental Group.

	CTBS Percentile (Grade 4)	CTBS Percentile (Grade 11)	Deviation from Base-line Mean
Boys	84	86	13.7
	62	61	-11.3
	64	66	-6.3
	93	90	17.7
	56	56	-16.3
	72	71	-1.3
	69	71	-1.3
	78	76	3.7
	79	78	5.7
	58	61	-11.3
Girls	57	53	-19.3
	61	60	-12.3
	55	59	-13.3
	93	96	23.7
	84	83	10.7
	78	75	2.7
	85	88	15.7
	66	68	-4.3
	70	70	-2.3
	82	81	8.7
Average	72.3		0.15

TABLE 19: Raw Scores for Boys and Girls in the Control Group.

	CTBS Percentile (Grade 4)	CTBS Percentile (Grade 11)	Deviation from Base-line Mean
Boys	71	72	0.85
	75	73	1.85
	57	54	-17.15
	93	95	23.85
	81	83	11.85
	62	64	-7.15
	69	71	-0.15
	54	55	-16.15
	90	88	16.85
	51	52	-19.15
Girls	78	74	2.85
	68	71	-0.15
	64	62	-9.15
	98	93	21.85
	55	51	-20.15
	61	67	-4.15
	58	57	-14.15
	77	79	7.85
	82	85	13.85
	79	80	8.85
Average	71.15		0.15

Appendix B

Formula to Find Standard Error for Use in Statistical Method One

Where

m = Deviation from baseline mean.

x = Average deviation from baseline mean.

n = Total number of raw scores.

s^2 = Variance of deviation from baseline mean.

SE = Standard error.

Step 1: Calculate s^2.

$$s^2 = \frac{(m_1-x)^2 + (m_2-x)^2 + \ldots + (m_n-x)^2}{n-1}$$

Step 2: Calculate SE.

$$SE = \sqrt{(s^2/n)}$$

Appendix C

Table 20

Critical Values of t at the 0.05 Level of Significance

Degrees of Freedom	0.05
1	12.706
2	4.303
3	3.182
4	2.776
5	2.571
6	2.447
7	2.365
8	2.306
9	2.262
10	2.228
11	2.201
12	2.179
13	2.160
14	2.145
15	2.131
16	2.120
17	2.110
18	2.101
19	2.093
20	2.086
21	2.080
22	2.074
23	2.069
24	2.064
25	2.060
26	2.056
27	2.052
28	2.048
29	2.045
30	2.042
40	2.021
60	2.000
120	1.980
∞	1.960

Appendix D

Formulae to Find t

Mean:

$$A = \frac{\sum A_1}{N_A}$$

Where

A = the mean of the experimental group.

$\sum$ = the sum of the individual scores for the experimental group.

A_1 = each raw score of the experimental group.

N_A = the total number of raw scores for the experimental group.

Mean:

$$B = \frac{\sum B_1}{N_B}$$

Where

B = the mean of the control group.

$\sum$ = the sum of the individual scores for the control group.

B_1 = each raw score of the control group.

N_B = the total number of raw scores for the control group.

Degrees of Freedom:

$$v = N_A + N_B - 2$$

Where

v = the degrees of freedom

Variance

$$\text{est } \sigma^2_{A-B} = \frac{\sum_{i=1}^{N_A}(A_i-A)^2 + \sum_{i=1}^{N_B}(B_i-B)^2}{v} \quad \frac{N_A + N_B}{N_A N_B}$$

Where

$\sum(A_i-A)^2$ = the sum of the squared deviation from the sample mean for the experimental group.

$\sum(B_i-B)^2$ = the sum of the squared deviation from the sample mean for the control group.

$\text{est } \sigma^2_{A-B}$ = the estimated variance of the sample.

Standard Deviation

$$\text{est } \sigma_{A-B} = \sqrt{(\text{est } \sigma^2_{A-B})}$$

Where

$\text{est } \sigma_{A-B}$ = the estimated standard deviation of the difference of the two sample means.

t-Ratio

$$t = \frac{A - B}{\text{est } \sigma_{A-B}}$$

Where

t = the t-ratio.

Appendix E

Program to Compute Critical-T

```
10   HOME
20   INPUT "ENTER HOW MANY SCORES IN THE FIRST
     GROUP":G1
25   INPUT "ENTER HOW MANY SCORES IN THE SECOND
     GROUP":G2
30   DIM NA(G1): DIM NB(G2): DIM D1(G1): DIM
     D2(G2): DIM T1(G1): DIM T2(G2)
35   PRINT "ENTER SCORES FOR FIRST GROUP "
40   FOR C = 1 TO G2
50   INPUT NA(C)
60   NEXT C
65   PRINT "ENTER SCORES FOR SECOND GROUP "
70   FOR C = 1 TO G2
75   INPUT NB(C)
77   NEXT C
80   LET M1 = 0: LET M2 = 0
90   FOR C = 1 TO G1
100  LET M1=M1 + NA(C)
110  NEXT C
112  FOR C = 1 TO G2
115  LET M2 = M2 + NB(C)
117  NEXT C
118  PRINT CHR4 (4):"PR#1"
120  LET A1 = M1 / G1: LET A2= M2/ G2
125  PRINT "THE MEAN FOR THE FIRST GROUP IS ";A1
127  PRINT "THE MEAN FOR THE SECOND GROUP IS ";A2
130  FOR C = 1 TO G1
140  LET D1(C) - A1
150  NEXT C
160  FOR C = 1 TO G2
170  LET D2(C) = NB(C) - A2
180  NEXT C
185  LET T1 = 0: LET T2 = 0
190  FOR C = 1 TO G1
200  LET T1 = T1 + (D1(C)) ^2
210  NEXT C
215  PRINT "THE VARIANCE FOR THE FIRST GROUP IS
     ";T1
220  FOR C = 1 TO G2
230  LET T2 = T2 + (D2(C)) ^ 2
240  NEXT C
250  PRINT 'THE VARIANCE FOR THE SECOND GROUP IS
     ";T2
255  PRINT "THE STANDARD DEVIATION OF THE FIRST
     GROUP IS "; SQR (T1)
```

```
257  PRINT "THE STANDARD DEVIATION OF THE SECOND
     GROUP IS "; SQR (T2)
260  LET EST = SQR (((T1 + T2) / (G1 + G2 - 2)) *
     ((G1 + G2) / (G1 * G2)))
270  PRINT "THE ESTIMATED STANDARD DEVIATION FOR
     THE POPULATION IS "; EST
280  LET TS = (A1 - A2) / EST
290  PRINT "THE T-SCORE IS ";TS
295  PRINT CHR$ (4); "PR#0"
300  END
```